DOCUMENT RESUME

ED 101 010 95 TM 004 243

AUTHOR	Davis, J. Kent
TITLE	Hypothesis Testing as a Function of an Individual's Cognitive Style.
SPONS AGENCY	National Center for Educational Research and Development (DHEW/OE), Washington, D.C. Regional Research Program.
BUREAU NO	BR-1-E-067
PUB DATE	[Apr 74]
GRANT	OEG-5-71-0035
NOTE	7p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, Illinois, April, 1974)
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	*Cognitive Processes; Cognitive Tests; *Feedback; *Hypothesis Testing; Negative Reinforcement; Performance; Positive Reinforcement; *Problem Solving; Response Mode; *Response Style (Tests)
IDENTIFIERS	Cognitive Style; Hidden Figures Test

ABSTRACT

The influence of an individual's cognitive style on hypothesis testing behavior was investigated. Thirty analytic and 30 global subjects each solved 24, 16-trial problems with intermittent reinforcement, i.e., E said "right" or "wrong" after every fifth response. Results indicated that the analytic subjects solved more problems correctly than did the global subjects. Furthermore, there was some question that both analytic and global subjects had little trouble with problems which provided positive feedback, but, on problems with negative feedback, global subjects seemed to have considerably more difficulty than did analytic subjects. (Author)

11.07

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY
J. KENT DAVIS
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

ED101010

HYPOTHESIS TESTING AS A FUNCTION OF AN INDIVIDUAL'S COGNITIVE STYLE[1]

J. Kent Davis

Purdue University

Davis and Klausmeier (1970) and Davis (1972a) reported that individuals with a global cognitive style were less efficient than analytic Ss in learning to identify concepts. Davis (1972b) found that global Ss had a higher frequency of repeating previous card choices and offering duplicate hypotheses than did analytic Ss. The results of this study suggested that global Ss had a tendency to reject the feedback of the E once they had erroneously arrived at a solution. A subsequent study (Davis, 1973) also found that global Ss had a higher percentage of error hypotheses than did analytic Ss. The results of these studies taken together suggests that part of the global Ss learning deficiency is attributable to inefficient methods of utilizing feedback. The major purpose of the present study was to determine if there is a difference between analytic and global Ss in terms of the effects of positive and negative feedback upon a S's hypothesis testing behavior.

METHOD

Subjects. The Hidden Figures Test (HFT) was administered to 320 introductory educational psychology students. Separate distributions of the HFT scores were made for male and female Ss (males $\bar{X}$ = 23.78, S.D. = 8.07; females $\bar{X}$ = 23.43, S.D. = 7.65). Fifteen analytic males and 15 analytic females were selected from the pool of S's scoring one standard deviation above the mean and 15 global males and 15 global females were selected from the pool of S's scoring one standard deviation below the mean.

Stimulus Materials. The stimulus materials were drawn of 7.5 x 12.5 cm. cards and each card contained a pair of stimuli which varied on four dimensions: letter (2 consonates), color (purple, blue, yellow, green, brown, red or black), size (large or small), and position (left or right). Twenty-four problems were constructed with 16 cards per problem. Within a problem, there were two sets of four different consonate pairs. Figure 1 provides a description of one set along with a description of the eight possible response patterns corresponding to each of the four major stimulus dimensions. This set of stimulus materials is internally orthogonal in that each value of each dimension is paired equally often with each value of every other dimension. The advantage of an internally

---

[1]Paper presented at the annual meeting of the American Educational Research Association, Chicago 1974. This research was supported in part by Grant OEG-5-71-0035 from the U.S. Office of Education.

TM004243

orthogonal set of stimuli is that it provides the experimenter an opportunity to identify a S's working hypothesis by examining the pattern of responses across the four consonate pairs. A second set of stimulus pairs was constructed by interchanging the position of each consonate and its corresponding values within a given pair of consonates. For example, the compliment of the set illustrated in Figure 1 would consist of a large white "K" on the right and the small black "D" on the left for the first stimulus pair. Reversing each of the stimulus pairs in Figure 1 would generate a new set of four pairs which would be internally orthogonal and would not be identical to any of the original set. Referring to one set as Set A and the interchanged set as Set B, Set A was used for all nonoutcome trials (E provides no feedback) and Set B was used for all outcome trials (E says "right" or "wrong"). In the 16-trial problem an outcome was presented on the first, sixth and eleventh trial and no outcome was presented on trials 2-5, 7-10, or 12-15. Figure 2 presents a summary of a 16 trial problem.

Procedure. The procedure followed was similar to that outlined by Levine (1966). Each S was fully instructed concerning the nature of the task, and was given four sample problems to solve in order to familarize him with the feedback procedures. Following the instructions and the preliminary problems, each S was presented 24 16-trial problems. Feedback was presented on trials 1, 6, and 11. That is, the E said "right" or "wrong" on these trials according to a prearranged schedule regardless of the S's response. Each of eight possible right-wrong sequences which could occur on the three outcome trials was randomly assigned to each of the first eight problems and then randomly assigned to each of the remaining two blocks of eight problems each. Trial 16, the last trial on each problem, was treated separately. Each S was told "right" on half of the problems and told nothing on the other half.

RESULTS

Blank Trials Data. Within each of the 24 problems, there were three sets of four cards to which the Ss responded but did not receive any feedback. Each of these sets was analyzed in terms of the response sequences Ss manifested. Each S's four trial pattern was categorized as being either consistent or inconsistent. The consistent patterns were those patterns which were consistent with the feedback supplied on the outcome trials. Thus, after trial one there were four possible consistent response patterns, after trial six there were two possible consistent response patterns and after trial 11 there was only one possible response pattern which would be consistent with the feedback. The inconsistent patterns were those patterns which either reflected errors (i.e., 3-1 patterns) or patterns which were inconsistent with the feedback supplied on the outcome trials. Overall, it was found that 80 percent of the nonoutcome sets conformed to all previously presented information and that errors or inconsistent response patterns occurred on 20 percent of the nonoutcome trials. When this analysis was broken down by cognitive style, it was found that the analytic Ss had 82.5 percent of the nonoutcome sets which were consistent with previously presented information and 17.5 percent of the nonoutcome sets which were inconsistent with previously presented information. The global Ss had 77.1 percent consistent response patterns on the nonoutcome sets and 22.9 percent inconsistent response patterns on the nonoutcome sets. There were no differences between male and female patterns.

Problem Solution. Each of the 60 Ss solved 24, 16-trial problems. A problem was considered as being correctly solved if each of the three non-outcome sets within a problem followed a response sequence which was consistent with the feedback information presented on the outcome trials. Each of these problems were scored as correctly solved and then the total number of problems correctly solved was analyzed by means of an analysis of variance with the variables of sex and cognitive style. There was a significant effect of cognitive style ($F = 3.73$, $df = 1/56$; $p < .05$). Analytic Ss solved an average of 15.18 problems while global Ss solved an average of 13.13 problems. Neither the effect of sex nor the interaction of cognitive style by sex were significant.

Within each of the 24 problems, there were eight different sequences of feedback. The percent of problems correctly solved under the eight conditions of feedback is presented in Table 1. The problems in which the outcome trials resulted in the E saying "right" were solved by both analytic and global Ss with a good deal of proficiency. There seems to be a trend which shows that problem solution becomes more and more difficult as the number of negative feedbacks increase. When all three outcome trials resulted in a "wrong" feedback, performance was very poor, but analytic Ss seem to be better able to process this negative feedback than do global Ss.

TABLE 1

PERCENT OF PROBLEMS SOLVED AS
A FUNCTION OF SEQUENCE OF FEEDBACK

Cognitive Style	Feedback Patterns							
	R R R	R R W	R W R	W R R	R W W	W R W	W W R	W W W
Analytic	93	73	76	73	48	48	58	39
Global	90	58	58	82	31	44	53	23
Total	92	66	67	78	39	46	56	31

The Effects of Outcomes. Levine (1970) has postulated a general model of hypothesis testing which predicts that Ss will retain their working hypothesis when it is confirmed and will reject the working hypothesis when it is disconfirmed. The effect of E's saying "right" or "wrong" may be determined by comparing the hypothesis a S manifests before and after each outcome. This analysis involved only those response patterns which were interpretable (i.e., did not consider any of the error patterns). The percent of Ss who

kept their working hypothesis was determined by counting the response patterns which were the same on two successive sets of nonoutcome trials (the first and second or the second and third) when the intervening outcome trial resulted in the E saying "right". The overall percentage, based on 1286 cases, was 97.5 percent. Thus 97.5 percent of the time a S kept his working hypotheses when he received a confirmation outcome. Two-and-one-half percent of the time a S switched his working hypothesis. It should be noted, however, that 11.5 percent of the time Ss manifested a response sequence which was inconsistent with previous information. When these results were determined separately for analytic and global Ss, similar findings were obtained. For analytic Ss, 97.2 percent of the hypothesis patterns were the same when Ss received confirmation on the outcome trials and 2.7 percent of the response patterns changed. Analytic Ss, however, had 10.9 percent inconsistent response patterns. For global Ss, 97.8 percent of the hypothesis patterns were the same when Ss received confirmation on the outcome trials and 2.2 percent of the response patterns changed. Inconsistent hypothesis patterns for the global Ss were reflected 12.1 percent of the time.

Levine's model (1970) predicts that when a S is told "wrong" on an outcome trial, that he will drop his working hypothesis and switch to another hypothesis. When the effects of a wrong feedback were assessed, the overall percentage of switches, based on 1267 cases, was 99 percent. Thus 99 percent of the time a S switched his working hypothesis when he received a disconfirming outcome. It should be noted, however, that 32.4 percent of the time Ss switchedto a working hypothesis which was inconsistent with previously obtained information. Analysis of these results by cognitive style revealed that analytic Ss switched their working hypothesis 99 percent of the time when they received a "wrong" outcome. Inconsistent hypothesis patterns however, were adopted 25.8 percent of the time. For global Ss, 98.9 percent of the time a S switched his working hypothesis following a "wrong" outcome, but 38.9 percent of the time these switches resulted in the adoption of an inconsistent hypothesis pattern.

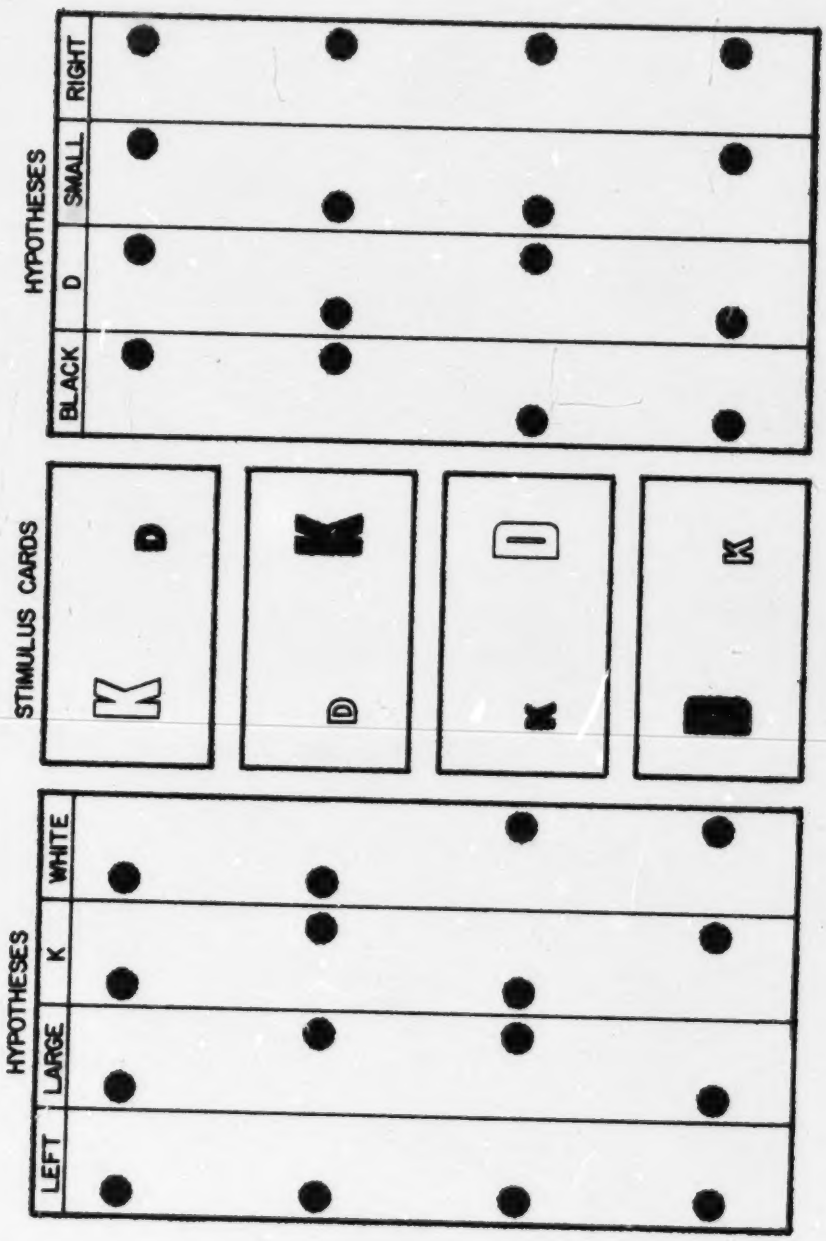
SUMMARY

In general the results of this experiment support the model of hypothesis testing developed by Levine (1966, 1970), but also extends the method of analysis by considering consistent and inconsistent response patterns.

Several differences in performance of analytic and global Ss were found. First, examination of the blank trials data indicated that analytic Ss had a higher percentage of nonoutcome sets which were consistent with previously presented information than did global Ss. Second, analytic Ss solved a significantly greater number of problems than did global Ss. Finally, it was found that analytic and global Ss differed little in terms of utilizing positive feedback, but that global Ss encounter considerably more difficulty in processing negative feedback than did analytic Ss. This finding suggests that part of the deficit in the global Ss performance is due to a faulty encoding process. Additional research is needed to further clarify the process of encoding stimulus information as it relates to an individual's cognitive style.

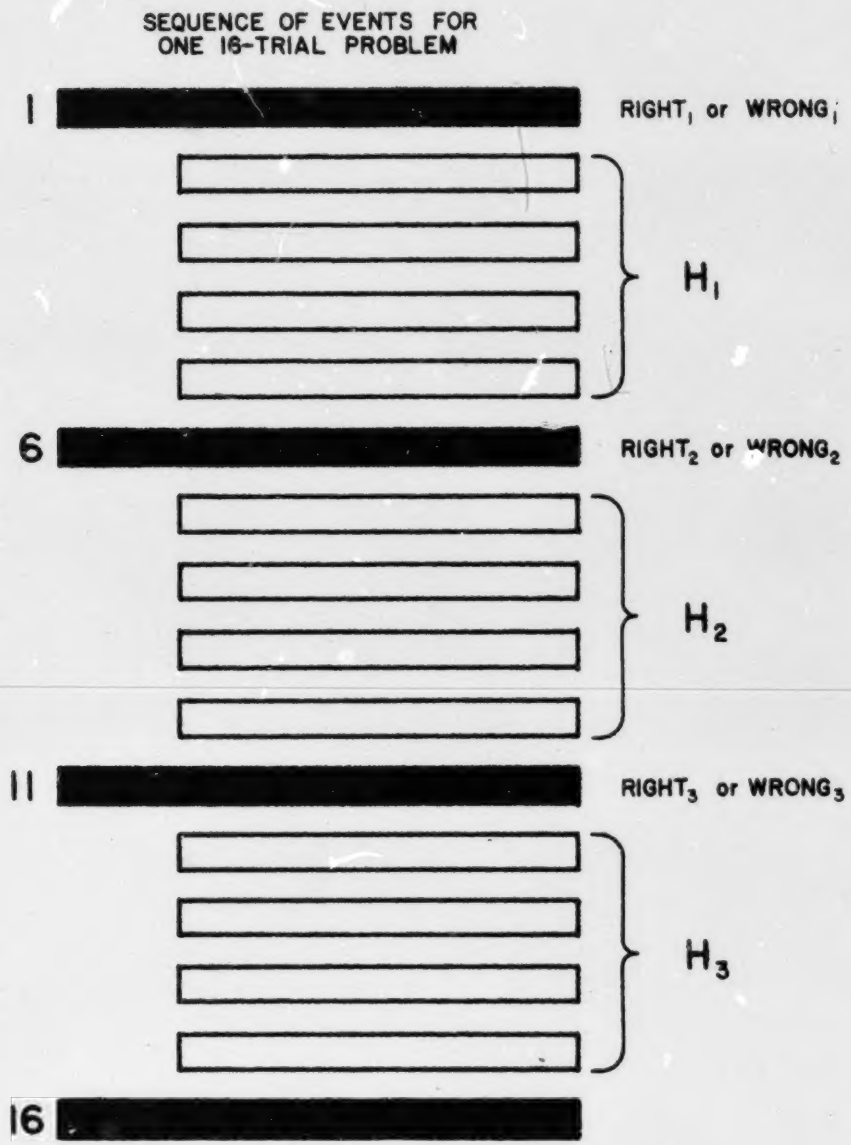
BEST COPY AVAILABLE

Figure 1. Sample four-trial problem and response sequence.



BEST COPY AVAILABLE

Figure 2. A schematic of the 16-trial problem.



BEST COPY AVAILABLE

REFERENCES

Davis, J. K. & Klausmeier, H. J. Cognitive style and concept identification as a function of complexity and training procedures. Journal of Educational Psychology, 1970, 61, 423-430.

Davis, J. K. Cognitive style and conditional concept learning. A paper presented at the annual meeting of the American Educational Research Association, Chicago, April, 1972. (a)

Davis, J. K. Strategy development and hypothesis testing as a function of an individuals cognitive style. Final Report of Project 1-E-067, U.S. Department of Health, Education, and Welfare, 1972, pp. 87. (b)

Davis, J. K. Cognitive style and hypothesis testing. A paper presented at the annual meeting of the American Educational Research Association, New Orleans, March, 1973.

Levine, M. Hypothesis behavior by humans during discrimination learning. Journal of Experimental Psychology, 1966, 71, 331-338.

Levine, M. Human discrimination learning: the subset-sampling assumption. Psychological Bulletin, 1970, 74, 397-404.